

DESCRIPTION FOR THE GENERAL PUBLIC

Influence of cucumovirus satellite RNA on virus transmission within plants and by insect vectors

Satellite RNAs (satRNAs) are small RNA molecules that require helper virus for their multiplication and transport. They are associated with certain plant virus strains, for example peanut stunt virus (PSV) and cucumber mosaic virus (CMV). Besides, similarity in multiplying mechanism between satRNA and viroids has been highlighted. Viroids are also small RNA molecules, but they do not need helper virus for multiplication and transport. Viroids, depending on the family they belong to, they can localize in nucleus or chloroplasts. Whereas, satRNAs are considered to occur in cytoplasm. Nonetheless, recent experiments on CMV satRNA showed that they may localize in nucleus. Our recent high-throughput studies on proteins and mRNA of *Nicotiana benthamiana* plants infected with PSV with or without satRNA revealed a strong influence of satRNA on chloroplast-associated proteins and RNA, therefore, our aim is to investigate PSV satRNA localization in *N. benthamiana* plants. For that reason, RNA-tagging assay will be used to enable fluorescence signal observation with confocal microscopy.

PSV and CMV infections lead to leaf malformations and discolorations, plant stunting, as well as in some circumstances – necroses. Additionally, satRNAs may influence the infection symptoms - exacerbating or attenuating them. They can have an impact on the virus amount in plant tissues. This changes may result from plant defense reaction on small RNA (sRNAs) molecules level, associated with RNA silencing process. sRNAs attached to certain proteins in host cells may have an effect on viral genetic material multiplication, leading to the reduction in the virus amount. Our recent studies on mRNAs from *N. benthamiana* plants infected with PSV (with or without satRNA) resulted in the increase in the levels of mRNAs of genes coding for proteins taking part in the mentioned process. Therefore, we would like to verify how satRNA influences virus transport throughout its association with RNA silencing activity. To do so, sRNAs will be isolated from plants infected with CMV and PSV (with or without satRNA) and analyzed toward their participation in silencing process. Moreover, accumulation of viral genetic material will be evaluated on different plant levels.

Viruses are able to spread throughout the plant, but also from plant to plant. Insects are used by viruses and, therefore, virus spread depends on the virus-insect-host plant interactions. Because satRNA has an impact on virus amount in plant tissues and leads to the changes in plant metabolism, so as a result their presence may cause changes in the substances excreted by plants. These, in turn, attract or repel insects, what affects their feeding preferences. Thus, satRNA can regulate virus transport efficiency. Hence, the planned research aim to show satRNA influence on CMV and PSV transport by aphids and their preying preferences on plants infected with virus and satRNA or virus alone. Plants will be exposed to aphid feeding, preceded by insect preying on the healthy plants as well as infected with the viruses (with or without satRNA). Virus presence in insects will be determined as well, followed by the evaluation of symptom emergence pace on the plants being fed. Moreover, aphids will be studied for their feeding preferences (preying intensity) between plants infected with virus and virus with satRNA.

The subject matter of satRNA impact on virus spread in plants and their transport by insects will be undertaken, as the knowledge connected with satRNA biology, especially within the area we want to explore, has been still incomplete. The results of our previous research provide some assumptions toward the aspects mentioned above, therefore, the continuation of the studies is necessary for better explanation of these processes. SatRNAs have very strong impact on the virus and the host plant as well, for that reason the biological basics are needed to be evaluated.